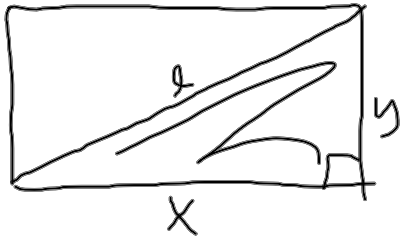
3.7/8



1) ✓

2) $l=\sqrt{x^2+y^2}$

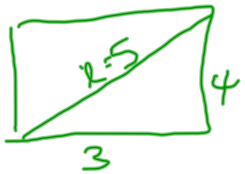
$l^2=x^2+y^2$ ✓

3) $2l\frac{dl}{dt}=2x\frac{dx}{dt}+2y\frac{dy}{dt}$

$l\frac{dl}{dt}=x\frac{dx}{dt}+y\frac{dy}{dt}$

8b 4) $\frac{dx}{dt}=+\frac{1}{2}$ $\frac{dy}{dt}=-\frac{1}{4}$

when $x=3, y=4$, what is $\frac{dl}{dt}$?

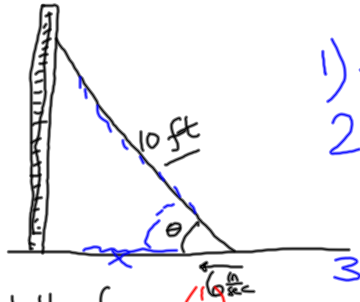


$l\frac{dl}{dt}=(3)(\frac{1}{2})+(4)(-\frac{1}{4})$

$5\frac{dl}{dt}=\frac{3}{2}-1=\frac{1}{2}$

$\frac{dl}{dt}=(\frac{1}{5})(\frac{1}{2})=\frac{1}{10}$ ft/sec

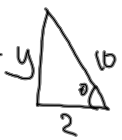
$\boxed{3.7/18}$



when bottom of plank is 2 ft from wall how fast is angle θ chging?

$\sqrt{100-4} = y$

$= \sqrt{96}$



$y^2+2^2=10^2$

1) ✓

2) $\cos\theta = \frac{x}{10}$

✓ $10\cos\theta = x$

3) deriv fft . . .

$-10\sin\theta \frac{d\theta}{dt} = \frac{dx}{dt}$

$-10\left(\frac{\sqrt{96}}{10}\right)\frac{d\theta}{dt} = \cancel{-6}\ -\frac{1}{2}$

$\frac{d\theta}{dt} = \frac{\cancel{-6}\ \frac{1}{2}}{-\sqrt{96}}$

$\frac{d\theta}{dt} = \frac{\frac{1}{2}\ \cancel{6}}{\sqrt{96}}\ \frac{\text{radians}}{\text{sec}}$

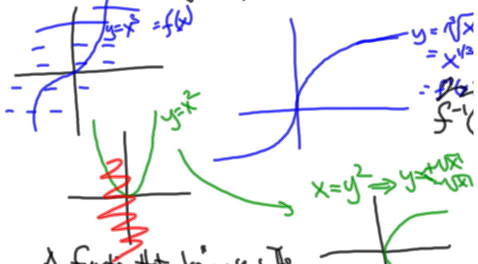
$= \frac{1}{2\sqrt{96}}$ rad/sec

Inverse functions

1) to find an inverse function, switch x's and y's and solve for y.

What if you can't?

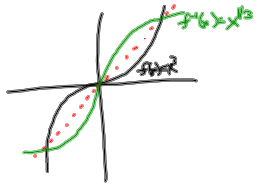
→ inverse of a function is ALSO a function if original passes HORIZONTAL line test



A function that also "passes the hor. line test" is called "one to one".

One to one ≡ invertible ≡ inverse is a functi

⇒ graph of a function is symmetrical with the graph of its inverse about $y=x$.



⇒ $f^{-1}(x)$ is the inverse of $f(x)$:

⇒ $f(f^{-1}(x)) = x$ for all the in domain of

⇒ $f^{-1}(f(x)) = x$ for all x in domain

$f(x) = x^2$ $[0,\infty)$

$f^{-1}(x) = \sqrt{x}$ $[0,\infty)$

$f(f^{-1}(x))$

$(\sqrt{x})^2 = x$

$f^{-1}(f(x)) = \sqrt{x^2} = |x|$

$= x$ but

$f^{-1}(a)=b \Leftrightarrow f(b)=a$

$f(x)= x^3+x+1=4$

$f^{-1}(4)=q \Leftrightarrow f(q)=4$

$f(f^{-1}(x))=x$

$[f(f^{-1}(x))]'=\frac{d}{dx}(x)=1$

$f'(f^{-1}(x))\cdot[f^{-1}(x)]'=1$

$[f^{-1}(x)]'=\frac{1}{f'(f^{-1}(x))}$

$f(x) = x^5 + x + 1$

find $(f^{-1})'(x)$.

$f(f^{-1}(y)) = y \xrightarrow{\text{chain rule + algebra}} [f^{-1}(y)]' = \dfrac{1}{f'(f^{-1}(y))}$

$f(y) = y^5 + y + 1$

$f'(y) = 5y^4 + 1$

$\therefore [f^{-1}(y)]' = \dfrac{1}{f'(f^{-1}(y))}$

$= \dfrac{1}{5y^4 + 1}$

Inverse functions

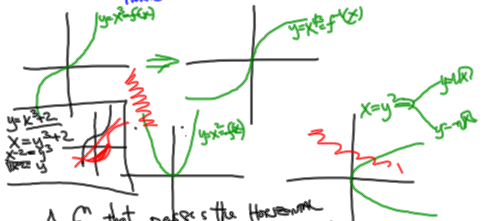
→ to find $f^{-1}(x)$, switch xs & ys and solve for y....

$\{(1,2),(2,2),(3,7)\}$ $\{(2,-2)\}$

$\{(2,1),(7,3),(-2,2),(2,2)\}$

What if you can't?

⟹ for inverse to be a function, the original f^n must pass the HORIZONTAL LINE test.



A f^n that passes the HORIZONTAL line test is called ONE TO ONE.

ONE to ONE f^n ≡ invertible ≡ has an inverse function

⟹ The graph of a function and the graph of its inverse are reflections about $y=x$

→ $f^{-1}(x)$ is the inverse of $f(x)$ if:

a) $f(f^{-1}(x))=x$ for every x in the domain of $f^{-1}(x)$

b) $f^{-1}(f(x))=x$ for every x in the domain of $f(x)$

domains

~~$\mathbb{R}$~~ $[0,\infty)$ $f(x)=x^2$

$[0,\infty)$ $f^{-1}(x)=\sqrt{x}$

$f(f^{-1}(x))=(\sqrt{x})^2=x$ ✓

$[0,\infty)$?

$f^{-1}(f(x))=\sqrt{x^2}=|x|$

$=x$ for $[0,\infty)$

⟹ Range of $f^{-1}(x)$ is Domain of $f(x)$

Domain of $f^{-1}(x)$ is Range of $f(x)$

⟹ $f^{-1}(a)=b \iff f(b)=a$

$f(x)=x^3+x+1=4$

$f^{-1}(4)=? \iff f(?)=4$

$$\left[f\left(f^{-1}(x)\right)\right]' = [x]'$$

$$f'\left(f^{-1}(x)\right) \cdot \left[f^{-1}(x)\right]' (1) = 1$$

$$\frac{d}{dx}\left[f^{-1}(x)\right] = \frac{1}{f'\left(f^{-1}(x)\right)}$$